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(54) FILLING TUBULAR CONTAINER.

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66188/60 241670 60.9

(57) CLAIM 1. A method of producing a tubular container filled with a viscous substance, comprising forming a tubular body with an internal detent at one end, placing within the body at the opposite end from the detent a sliding seal fitting closely within and transversely covering the bore of the body, locating the outer side of the seal in a sealing manner against a dispensing nozzle for the substance, delivering the substance under pressure through the nozzle into the body to thereby force the seal along the body at the front of a continous mass of substance until the seal is stopped by the detent, interrupting the flow of substance from the nozzle, withdrawing the filled tubular body, and closing the end of the tubular body opposite from the detent.

This invention relates to containers and method of filling such containers. More particularly, it relates to such containers and a method of filling them which have features of importance in the production of packaged products of certain fluid substances, for example, liquids, pastes, slurries and other plastic masses of a viscous nature.

Automatic tube filling and closing machines and their method of operation to fill toothpaste tubes and similar articles are well known in the prior art. The manner of operation in all these known cases is the so called "bottom filling" method and is employed in order to avoid air being entrapped in the contents of the tube. This problem becomes a peculiarly difficult and troublesome one when injecting substances of high viscosities into containers, which have small diameters in relation to their lengths.

In the "bottom filling" method, the dosing nozzle of the machine is inserted downwardly into the empty package before the nozzle commences feeding. As the substance to be packaged begins to flow out of the nozzle opening, the package and the nozzle are withdrawn relative to each other in a vertical direction at the same rate as that at which the level of the substance rises in the package. When the predetermined level of the substance has been reached in the package, the flow from the dosing nozzle is interrupted and the nozzle

and package are separated a further distance so as to be clear of each other to enable the machine, if automatic, or the operator manually to replace the filled package with an empty package. The withdrawal of the nozzle or package during the "bottom filling" operation is normally a mechanical function of the filling or dosing machine and usually is restricted to a movement, which limits packages to a maximum length of 300 mm only in most commercially available containers. A further disadvantage of these known filling operations is that they are time consuming.

The rapidly increasing popularity during the last decade of slurry blasting explosives for blasting purposes in mining and quarrying operations and in civil engineering has given rise to a strong demand for packaged slurries. Such slurries are invariably of a highly viscous nature. Furthermore, the bore holes required to be loaded with blasting explosives are of small diameter in relation to length, diameter being governed by the sizes of rock drill bits most generally used in the mining industry for economic and other reasons. It is an important requirement that there be no columnar discontinuity or large pockets of air in the slurry blasting explosives in a bore hole after its having been loaded by a slurry pumping operation since these explosives could fail to initiate. Cartridges of slurry blasting explosives tailored to fit bore holes for blasting purposes would of necessity have to be long and narrow and the same considerations would apply, that is, the column of slurry

blasting explosive filling each cartridge would be required to be devoid of any air gaps. A typical example of such a cartridge would be a tube measuring 25 mm in diameter and 600 mm in length. Such long cartridges, known generally in the mining industry as "unit charges", are replacing the conventional short cartridges used hitherto in charging up bore holes in hard rock. We are not aware of any known package or method of filling it which will produce efficently a completely filled container of such awkward dimensions with any degree of regularity on a commercial scale. It is self evident that the sclution to this problem may be of use in arts other than that of explosives.

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The object of the present invention is to minimise or eliminate the disadvantages discussed above in the efficient filling of containers with substances of a viscous nature.

Accordingly, this invention provides a method of producing a tubular container filled with a viscous substance, comprising forming a tubular body with an internal detent at one end, placing within the body at the opposite end from the detent a sliding seal fitting closely within and transversely covering the bore of the body, locating the outer side of the seal in a sealing manner against a dispensing nozzle for the substance, delivering the substance under pressure through the nozzle into the body to thereby force the seal along the body at the front of a continuous mass of substance until the seal is stopped by the detent, interrupting the flow of substance from the nozzle, withdrawing the filled tubular body, and closing the end of the tubular body opposite from the detent.

While the utility of this invention is not restricted to a tubular body of circular cross section

only and may be used for oval, square or other practical shapes, it is preferred that the bore of the body be of circular or of quasi-circular cross section. The material of which the tubular body is made may be rigid or flexible, provided that the flexible material is strong enough to withstand any tendency to distortion under the filling pressures to be employed. Generally, the choice of material will be from a metal, metallic alloy, cardboard, paper of the desired quality and thickness, papier maché or a synthetic plastics material.

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The sliding seal, which will be complementary to or mate with the desired cross sectional outline of the bore of the tubular body, may take the shape of a piston or a flat disc having integral stabilisers extending from around its periphery at about 90 degrees to its flat surface. Preferably, the sliding seal is in the shape of a cup or a hollow truncated cone. The choice of shape may be made with previous knowledge of the characteristics of the viscous substance to be packed, bearing in mind that leakage past the seal due to the pressure exerted on it by the substance injected by the filling nozzle should be minimal, if at all. Similarly, the sliding seal may be constructed of rigid or flexible material but the choice of a metal, metallic alloy, papier maché or a synthetic plastics material may be governed by the nature of the substance to be packed and the pressure exerted during the method of filling the tubular body.

The appropriate configuration of tubular body and co-operating sliding seal and the materials of which

they are made respectively may vary for the packaging of various types of viscous substances.

In a container, which is completely filled with a viscous substance, the sliding seal has been pushed to the lower or bottom end of the tubular body where it becomes a closure by being retained at that position in the bore of the tubular body by detent means. Such means may be a decreased bore diameter or inwardly protruding indentations, flange or thickened rim in the material of the tubular body or other suitable means.

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At the opposite and upper end of the tubular body, the closure means may comprise a plug or a cap fastened in or over that end by adhesive or screw threaded means. Where the container is to be discarded or destroyed with initial or sole use in the first instance of the contents of the container, a convenient or preferred closure means may comprise the folds of the inwardly folded-over wall of the upper end which folds have been tightly compressed together.

The present invention further provides a method of filling any of the containers of this invention as described herein comprising locating in a sealing manner the open upper end of the tubular body against the outer rim of a dispensing nozzle of a source of fluid viscous substance with the sliding seal in position adjacent said upper end and immediately under the nozzle, delivering the substance under pressure into the tubular body until the travel of the sliding seal down the bore is stopped by the detent means, interrupting the flow of substance from the nozzle, withdrawing the tubular body and fastening the closure means of the filled tubular body.

As regards fastening the closure means, this may comprise folding over the material of the wall at the upper end and inwardly into the bore of the tubular body and compressing the folds together by crimps applied by a star crimping tool.

The invention includes the product comprising a filled container as is described herein.

The invention is illustrated by an embodiment of the container and the method of filling it as is described hereafter by way of example with reference to the accompanying drawings, in which

Figure 1 is a view in section of an embodiment of the container at the stage of commencement of the filling method;

Figure 2 shows the container at an intermediate stage of the filling method;

Figure 3 shows the completely filled container at the conclusion of the filling step and prior to the final step of closing and fastening its open upper end;

Figure 4 is an enlarged section of a sliding seal in the shape of a cup;

Figure 5 is an enlarged section of a sliding seal in the shape of a hollow truncated cone, and

Figure 6 is an enlarged view in perspective of a sliding seal in the shape of a flat disc having integral stabilisers thereon.

Referring now to the drawings in which similar parts are indicated by the same numerals, the numeral 10 designates the tubular body of a container which, in

this embodiment, is fabricated of spirally wound laminated paper strip of suitable strength and rigidity to serve as a cartridge casing for a viscous formulation of slurry blasting explosive. A sliding seal 11 in the shape of a cup as exemplified in Figure 4 fits closely within and covers the bore 12 of circular cross section of the tubular body 10. Sliding seal 11 in this example has been made by an injection moulding of polyethylene. The lower end of the wall of the tubular body 10 terminates in an internal flange 13 or lip around the bore 12.

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In the method of this invention, shown schematically in Figures 1, 2 and 3, the upper end 14 of tubular body 10 is located firmly against the outer rim of filling nozzle 15 in a sealing manner so as to confine within the body the discharge pressure of the slurry from the nozzle 15. In this instance the manner of sealing is ensured by an annulus 16 of resilient material seated on the rim of the nozzle 15. It is envisaged that an accurately made tubular body could fit against a suitable design of nozzle co-operating therewith which would not require a sealing annulus for the purpose of this method. Any suitable manner of sealing serves the additional purpose of preventing overflow of a fluid viscous substance, which is wastefully uneconomic and imposes an extra good housekeeping duty on the operator.

The filling nozzle 15 is opened, the space defined between the nozzle and the sliding seal 11 is filled with slurry 17 which, under the discharge pressure of the nozzle, exerts a downward thrust against the sliding seal 11 to push it towards the lower end of the tubular body 10 while

simultaneously and completely filling the bore 12 between the mouth of the nozzle and the sliding seal as illustrated in Figure 2. The pressure is sufficiently high enough to overcome the frictional forces in the slurry 17 and the interface between the sliding seal 11 and the wall of the bore 12. The air in the bore 12 is expelled by the downward passage of the sliding seal 11.

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The flow of slurry from the nozzle is caused to cease at the instant that the travel of the sliding seal is stopped by the internal flange 13, the tubular body is withdrawn and the material of its wall at the upper end 14 is folded over and inwardly and the folds are compressed together by a star crimping tool. At this stage, the product manufactured comprises a completely filled and closure fastened cartridge of slurry blasting explosive.

Following the procedure of the method described, a batch of 120 cartridges measuring externally 25 millimetres in diameter and 600 millimetres in length were filled with a slurry blasting explosive having a viscosity rating of from 150 to 200 poises and sealed by crimps. From the known density of the slurry and the mass (weight) and capacity of the empty cartridges, the filled and closure fastened cartridges were weighed and calculated to be free of air pockets.

The claims defining the invention are as follows :

1. A method of producing a tubular container filled with a viscous substance, comprising forming a tubular body with an internal detent at one end, placing within the body at the opposite end from the detent a sliding seal fitting closely within and transversely covering the bore of the body, locating the outer side of the seal in a sealing manner against a dispensing nozzle for the substance, delivering the substance under pressure through the nozzle into the body to thereby force the seal along the body at the front of a continous mass of substance until the seal is stopped by the detent, interrupting the flow of substance from the nozzle, withdrawing the filled tubular body, and closing the end of the tubular body opposite from the detent.

2. A method as claimed in claim 1, wherein the tubular body is of circular or of quasi-circular cross section.

3. A method as claimed in claim 1 or 2, wherein the tubular body is constructed by a metal, metallic alloy, cardboard, paper, papier mache or a synthetic plastics material.

4. A method as claimed in any preceding claim, wherein the detent comprises decreased bore diameter or inwardly protruding indentations, flange or thickened rim in the tubular body.

5. A method as claimed in any preceding claim, wherein the end of the body opposite from the detent is closed by fastening a plug or a cap in or over the said end of the body by adhesive or screw threaded means.

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6. A method as claimed in any one of claims 1 to 4, wherein the end of the body opposite from the detent is closed by folding inwardly the wall of the body adjacent said end and tightly compressing together the folds so formed.

7. A method as claimed in any preceding claim, wherein the seal is a piston or a flat disc having integral stabilisers extending from its periphery at approximately 90 degrees to its flat surface.

8. A method as claimed in any one of claims 1 to 6, wherein the seal is in the shape of a cup or a hollow truncated core.

9. A method as claimed in claim 1 substantially as herein described with reference to Figs. 1 to 4, or Fig 5, or Fig.6 of the accompanying drawings.

10. A filled tubular container produced by a method according to any one of the preceding claims.

Dated this 27th day of November 1978

AECI LIMITED

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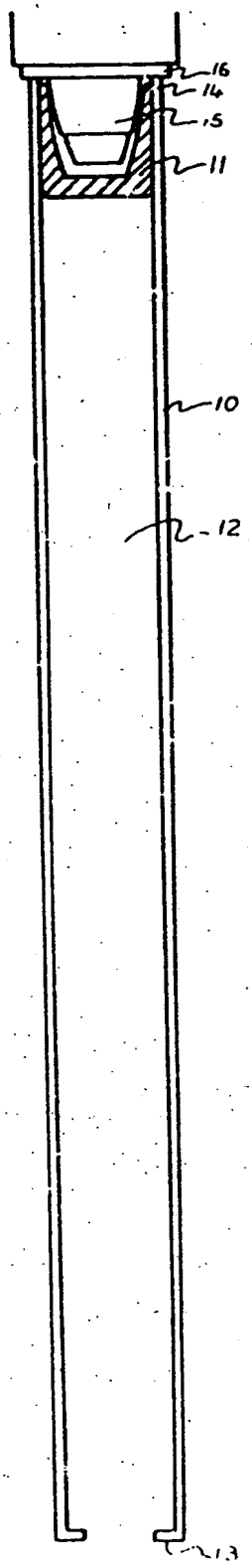

FIG. 1

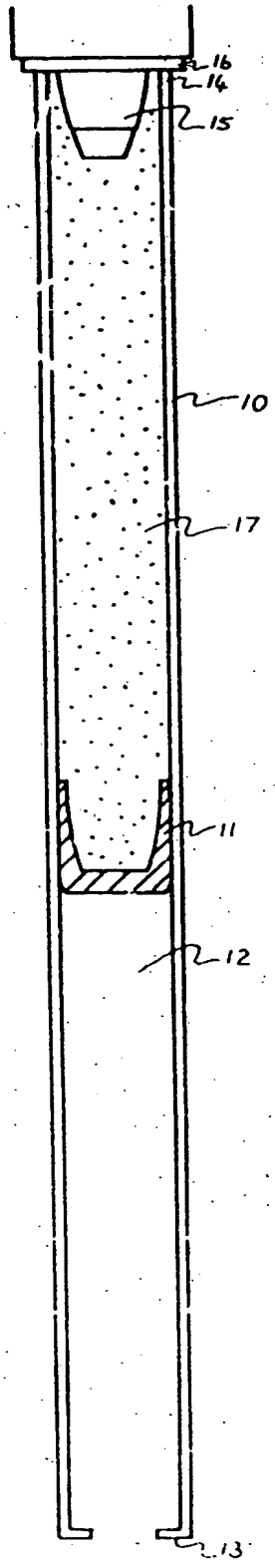

FIG. 2

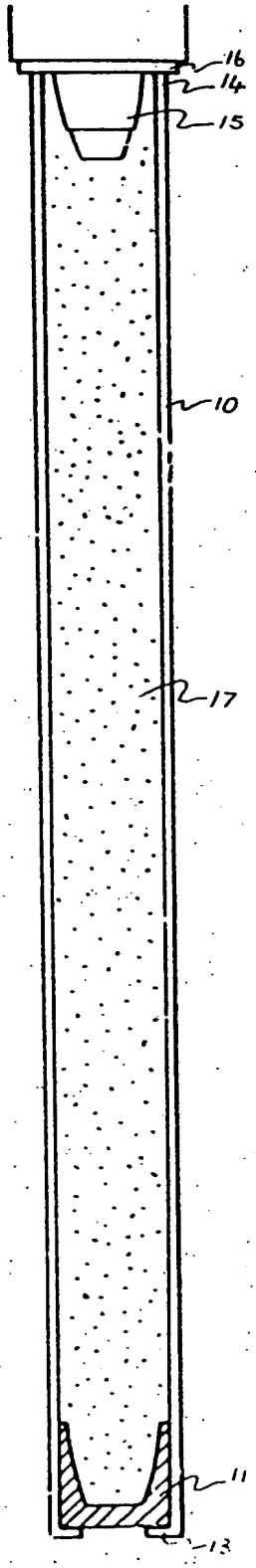

FIG. 3

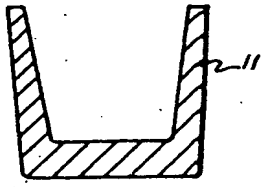

FIG. 4

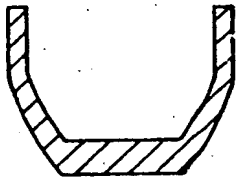

FIG. 5

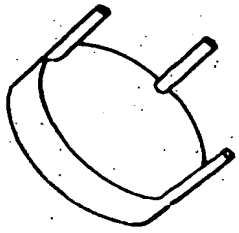

FIG. 6